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[54] **HARD MASKING METHOD FOR FORMING
PATTERNED OXYGEN CONTAINING
PLASMA ETCHABLE LAYER**

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[56] References Cited

U.S. PATENT DOCUMENTS

4,994,402	2/1991	Chiu	437/41
5,013,686	5/1991	Choi et al.	437/194
5,162,262	11/1992	Ajika et al.	437/200
5,219,788	6/1993	Abernathey et al.	437/187
5,246,883	9/1993	Lin et al.	437/195
5,256,248	10/1993	Jun	156/653
5,269,879	12/1993	Rhoades et al.	156/643
5,460,693	10/1995	Moslehi	156/662.1
5,472,913	12/1995	Havemann et al.	437/195
5,565,384	10/1996	Havemann	437/228
5,622,894	4/1997	Jang et al.	438/643
5,654,240	8/1997	Lee et al.	438/647
5,661,344	8/1997	Havemann et al.	257/758
5,700,737	12/1997	Yu et al.	438/636
5,721,172	2/1998	Jang et al.	438/424
5,840,624	11/1998	Jang et al.	438/624

5,858,623 1/1999 Yu et al. 430/315 p

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[57] ABSTRACT

A method for forming a patterned microelectronics layer within a microelectronics fabrication. There is first provided a substrate employed within a microelectronics fabrication. There is then formed over the substrate an oxygen containing plasma etchable microelectronics layer. There is then formed upon the oxygen containing plasma etchable microelectronics layer a hard mask layer. There is then formed upon the hard mask layer a patterned photoresist layer. There is then etched through use of a first anisotropic plasma etch method the hard mask layer to form a patterned hard mask layer while employing the patterned photoresist layer as a first etch mask layer. The first anisotropic plasma etch method employs an etchant gas composition appropriate for etching a hard mask material from which is formed the hard mask layer. There is then etched through use of a second plasma etch method the patterned photoresist layer from the patterned hard mask layer while employing the patterned hard mask layer as an etch stop layer while simultaneously etching the oxygen containing plasma etchable microelectronics layer while employing at least the patterned hard mask layer as a second etch mask layer to form a patterned oxygen containing plasma etchable microelectronics layer. The second plasma etch method employs an oxygen containing etchant gas composition. The method is particularly useful for forming patterned oxygen containing plasma etchable microelectronics dielectric layers within microelectronics fabrications.

16 Claims, 2 Drawing Sheets

